

Application No.: 10/809,169  
Docket No.: PE0667USDIV2

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## REMARKS

### *Status of the Application*

Claims 1-7, 9, 12, and 14-20 are pending in the application. The pending claims are objected to for informalities. The pending claims are also rejected under 35 U.S.C. § 102 over three references. The objections and rejections are addressed separately below.

### Claim Amendments

The claims are being amended per the Examiner's suggestions to address the cited informalities. Applicants thank the Examiner for these helpful comments and suggestions.

### *Claim Objections*

Applicants believe, and respectfully submit, that the claim informalities have been addressed and that the objections to claims 1, 4, 7, and 9 have been overcome. Accordingly, the Applicants respectfully request that the objections be withdrawn.

### *Claim Rejections – 35 U.S.C. § 102*

Claims 1-7, 9, 12, and 14-20 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kreuder, Kim '864 or Kim '974.

### Kreuder

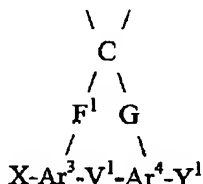
Kreuder, U.S. Patent No. 5,763,636, discloses a general formula (I) for a conjugated polymer including a spiro linkage (see claim 1, Col. 18, lines 35-40). Kreuder also identifies his polymers as containing spiro atoms (Abstract, formula (I)) and a plurality of spiro centers (Col. 2, lines 30-40). The examples of spiro-containing species shown at Col. 3, lines 35-45 and 50-55 are *excepted from* the disclosure (see Col. 3, lines 28-30). Spiro-containing compounds of the Kreuder disclosure are shown as structures in Examples 7, 8, 9 and 10. All of the other working examples (Examples 1 - 6) describe spiro-containing polymers or compositions. The copolymers of the present claims can only form spiro compounds if the adjacent R groups that are pendant from the central ring of the fluorene structure of Formula I form a 5- or 6- membered cycloalkyl, aryl or heteroaryl ring. Please see claim 1.

Kreuder's formula (I) discloses the spiro-containing SRU as shown below, in relevant part. In the scheme below, C is the spiro atom, F<sup>1</sup> and G are -CR<sup>1</sup>R<sup>1</sup>-, -O-, -S-, -NR<sup>3</sup>- or a chemical bond, Ar<sup>3</sup> and Ar<sup>4</sup> are defined at Col. 2, lines 43-53, V<sup>1</sup> is -CR<sup>5</sup>=CR<sup>6</sup>-, -CR<sup>7</sup>R<sup>8</sup>-, -CR<sup>9</sup>R<sup>10</sup>-, -CR<sup>11</sup>R<sup>12</sup>-, -NR<sup>3</sup>-, SiR<sup>14</sup>R<sup>15</sup>-, -O-, -S-, -So-, SO<sub>2</sub>-, -CO-, or a chemical bond (Col. 2, lines 54-57), and X and Y<sup>1</sup> are alike or different, cyclic or acyclic, conjugated hydrocarbons having from 2-100 (preferably 2-20) carbon atoms, which can also contain heteroatoms such

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as N, O, and/or S, and which can be substituted by one or more radicals, and can be H (Col. 2, lines 58-64):



The top portion of the SRU is capped at either end by  $-\text{[Ar}^5\text{]}_n-$  and  $-\text{[Ar}^6\text{]}_p-$ . Please see in general Col. 2, lines 26-64.

$\text{Ar}^3$  and  $\text{Ar}^4$  are *always* triyl (trivalent) whether they are aromatic or alicyclic, heteroaromatic or heterocyclic (please see Col. 2, lines 43-53 and associated text in claims 1 and 9) so that the pendant spiro unit in all of Kreuder's molecules is tricyclic in every instance. These are exemplified by the structures associated with Examples 7 – 10 and with the nomenclature of the other working examples. In the instances in which a monomer of a copolymer of the claims under review forms a spiro compound, there is pendant only a single ring, by definition in, e.g., claim 1, "adjacent R groups can form a 5- or 6- membered \* \* \* ring" and  $\text{R}^1$  by definition is a substituent on an R group and  $\text{R}^1$  does not, by definition, form additional rings.

Therefore, this rejection is respectfully traversed on the grounds that Kreuder does not disclose compounds of the invention, but rather discloses spiro compositions in which both moieties according to Kreuder's formula (I) and definitions have tricyclic systems. This does not occur in the claimed compositions, where spiro monomers have a monocyclic pendant system. In addition, the present claims address copolymers in which one or more monomers are selected from Formulae I and I(a) (the latter of which is not a spiro unit) and one or more monomers selected from Formula V. Kreuder discloses conjugated polymers where the monomers are derivatives of formula (I). Applicants respectfully submit that this rejection should be withdrawn.

#### Kim '864

Applicants respectfully traverse this rejection. To anticipate claims under review, the single prior art reference must disclose each and every limitation in the claims, in the order therein presented, and must enable the claimed invention. Kim '864 discloses a polymer described in the Abstract as a fluorene-based alternating polymer. An alternating polymer

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regularly repeats in the following manner, where A and B represent the repeating comonomers:

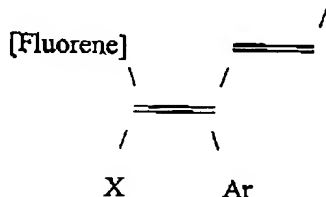


In this formula, A could be taken to represent the fluorene moiety and B the Ar moiety, so that the copolymer is apparently actually a repeating dimer of  $-A-B-$ .

The present claims are directed to a copolymer having at least one fluorene-based comonomer having Formula I or Formula I(a) and at least one comonomer having the tricyclic (or bicyclic ketone Vb) structure of Formula V (please see, e.g., claim 1 and claim 7). In Kim '864, as shown in formula (I) the basic structural repeat unit (SRU) or backbone of the alternating polymer includes  $-\equiv Ar-$  where Ar represents substituted or unsubstituted phenyl and is illustrated in the formulae shown at Col. 4, line 50 to Col. 7, line 5, as well as the acetylene group on each end of the SRU. Kim '864 does not disclose a polymer other than a strictly alternating pattern as depicted above. Table 1, Cols. 15-16 presents the chemical structures of polymers from Kim's working examples. All contain two acetylenic (ethynic) groups in the SRU; these are absent from any claimed copolymer and therefore the SRUs of Kim the SRUs in the claims under review are different, no matter how the various possible combinations are arranged. In addition, Kim '864 does not show any substitution on the phenyl rings of the fluorene comonomer, as do the claims under review. For these reasons, Kim '864 does not anticipate the pending claims. Applicants respectfully request that this rejection be withdrawn.

#### Kim '974

This rejection is also respectfully traversed. Kim '974 also discloses a fluorene-based alternating copolymer (Abstract). Formula (I) in Kim '974 depicts an SRU that contains a fluorene group and a side chain,



In the schematic shown in the previous section ( $-A-B-A-B-$ ) the fluorene group can be identified with A and the diene with pendant X and Ar may be identified as B. This is apparently also a repeating dimeric block that forms the strictly alternating copolymer. There

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is no such component in the present claims that corresponds with the disubstituted dieny1 B unit shown above.

Again, there is no equivalent side chain in any of the present claims. Like Kim '864, Kim '974 lacks any disclosure of a comonomer such as the claimed second monomer based on Formula V, which, as noted above, is required in the present claims. For these reasons, Kim '974 does not anticipate the pending claims. Applicants respectfully request that this rejection be withdrawn.

#### Conclusion

Applicants respectfully submit that a fully responsive paper is provided herein and that all pending objections and rejections have been overcome or rendered moot by the foregoing amendments and remarks. Accordingly, Applicants respectfully assert that the pending claims are in condition for allowance, and earnestly solicit a notice of allowance.

Respectfully submitted,



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